Bonneville Power Administration
Fish and Wildlife Program FY99 Proposal

Section 1. General administrative information

Recondition Wild Steelhead Kelts For Repeat Spawning

Bonneville project number, if an ongoing project 9090

Business name of agency, institution or organization requesting funding
Columbia River Inter-Tribal Fish Commission

Business acronym (if appropriate) CRITFC

Proposal contact person or principal investigator:

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Subcontractors.

Organization	Mailing Address	City, ST Zip	Contact Name
NA			

NPPC Program Measure Number(s) which this project addresses.
7.0A.1, 7.1B.2, 7.1C.3, 7.2C, 7.4D.2, potentially 7.4L.1, 7.4M, 7.4O.1

NMFS Biological Opinion Number(s) which this project addresses.
N/A

Other planning document references.
Wy-Kan-Ush-Mi Wa-Kish-Wit,

Subbasin.
Snake River

Short description.
Indentify the proportion of steelhead kelts outmigrating through juvenile bypass systems in the Snake River. Once identified, reconditioning kelts to augment wild Snake River steelhead populations.

Section 2. Key words

Mark	Programmatic Categories	Mark	Activities	Mark	Project Types
X	Anadromous fish		Construction		Watershed
	Resident fish		O & M	*	Biodiversity/genetics
	Wildlife	*	Production	*	Population dynamics
	Oceans/estuaries	X	Research		Ecosystems
	Climate		Monitoring/eval.		Flow/survival
	Other	*	Resource mgmt		Fish disease
			Planning/admin.	X	Supplementation
			Enforcement		Wildlife habitat en-hancement/restoration
			Acquisitions		

Other keywords.
steelhead kelts, steelhead kelt reconditioning, Snake River, iteroparity, life history diversity, supplementation

Section 3. Relationships to other Bonneville projects

Project #	Project title/description	Nature of relationship
0	(none)	
0		
0		
0		

Section 4. Objectives, tasks and schedules

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Enumerate kelts	a	Collect adult steelhead at Snake River bypass facilities.
		b	Use ultrasound techniques to

			identify pre and post spawned adults.
		c	Analyze data and include results in a report.
2	Validate kelt identification	a	Use ultrasound techniques at a hatchery
		b	Test ultrasound identification accuracy
		c	Analyze data and include results in a report.
3	Develop a key of morphological traits associated with kelts	a	Record physical data on adults collected at the dams.
		b	Compare physical data with ultrasound information to segregate pre and post spawned adults.
		c	Analyze data and include result in a report
4	Locate other facilities for kelt collection	a	Identify facilities (hatchery, weir, dams) were kelt identification and collection techniques can be applied
		b	Report results
5	Collect and recondition kelts	a	Collect Snake River kelts
		b	Build reconditioning structures
		c	Recondition kelts
6	Evaluate kelt reconditioning	a	Tag kelts before release
		b	Identify returning adults
		c	Analyze data and include in a report

Objective schedules and costs

Objective #	Start Date mm/yyyy	End Date mm/yyyy	Cost %
1	3/1999	5/1999	30.00%
2	4/1999	4/1999	1.00%
3	6/1999	7/1999	3.00%
4	3/1999	7/1999	4.00%
5	3/2000	1/2001	54.00%
6	9/2001	11/2001	8.00%
			TOTAL 100.00%

Schedule constraints.

No major foreseeable constraints

Completion date.
2001

Section 5. Budget

FY99 budget by line item

Item	**Note**	**FY99**
Personnel		$16,500
Fringe benefits	@ 31.5%	$5,198
Supplies, materials, non-expendable property	Ultrasound machine ($17,500)- no indirect cost associated. We will attemp to lease, to reduce cost	$18,375
Operations & maintenance		$3,125
Capital acquisitions or improvements (e.g. land, buildings, major equip.)		$0
PIT tags	# of tags:	$0
Travel	per diem, lodging	$2,720
Indirect costs	@ 37.8%	$10,742
Subcontracts		$0
Other		$0
TOTAL		$56,660

Outyear costs

Outyear costs	**FY2000**	**FY01**	**FY02**	**FY03**
Total budget	$85,741	$13,635	$0	$0
O&M as % of total	3.00%	1.00%	0.00%	0.00%

Section 6. Abstract

Abstract

Repeat steelhead spawners (iteroparous) may have significantly augmented early wild Snake River populations. Accurate information on steelhead kelts within the Snake River subbasin is lacking and anecdotal. In 1999 we propose to identify the number of steelhead kelts (post-spawned) outmigrating through Snake River bypass systems using ultrasound technology. An ultrasound image of a steelheads body cavity will be used to identify pre-spawned (i.e., with eggs or sperm) and post-spawned (i.e., without eggs and sperm) adults. Once identified, a kelt enumeration will be conducted on the data. If it is

found that significant numbers of kelts are prevented from reaching the sea, then measures will be initiated to aid kelt survival. Kelt reconditioning experiments on Atlantic salmon (*Salmo salar*) have provided the impetus for steelhead kelt reconditioning. In these studies, iteroparous salmonids were successfully captured, artificially reconditioned and held captive in fresh water for another spawning episode. In order to make kelt reconditioning and/or kelt transportation beneficial to Snake River populations, we must have an accurate estimate of the number of kelts traveling through the bypass systems. Such estimates will dictate the number of kelts which can be captured and reconditioned. Assuming the results obtained in 1999 are encouraging, kelt reconditioning and/or transportation studies will be initiated in 2000. Ultimately, enhancement efforts through kelt reconditioning may significantly supplement Snake River steelhead populations.

Section 7. Project description

a. Technical and/or scientific background.

Technical and/or scientific background

Populations of wild steelhead *(Oncorhynchus mykiss)* in the Snake River have declined from historical levels of 500,00 (US v. Oregon 1997) to only 8,600 at Lower Granite Dam in 1997 (USACE 1997b). They are now a threatened species under the Endangered Species Act (NMFS 1997). Causes of the decline are numerous and well known (NPPC 1986; TRP 1995), yet efforts to enhance wild populations are lacking (US v. Oregon 1997).

Main-stem Snake and Columbia River enhancement, monitoring and research actions have typically focused on two life history phases within steelhead; smolt outmigration and adult immigration. Very little information on steelhead kelts has been obtained from Columbia Basin stocks. The term kelt refers to any iteroparous (repeated births) salmonid, like steelhead and Atlantic salmon, which is capable of spawning again. Observations of this reproductive life history within Snake River steelhead date back to 1895 (United States Fish Commission 1895). Residents in Idaho noticed that steelhead, unlike other salmon in the Snake River, did not die after spawning but appeared to travel back to the ocean (United States Fish Commission 1895).

Repeat spawners (i.e., surviving kelts) may have significantly augmented early populations of Snake River steelhead. Recent estimates of repeat spawners in tributaries of the lower Columbia River have exceeded 17% (NMFS 1996), with some fish returning to spawn four consecutive times (Leider et al. 1986). In contrast, it is believed that very few, if any, repeat spawners currently exist in the Snake River subbasin (R. Carmichael, ODFW, personnel com.). Data on the number of kelts attempting outmigration in the Snake River is unknown.

Most summer steelhead navigate Snake River dams in September and October (U.S. versus Oregon 1997) and are believed to spawn from early April to May (SSR, 1992). Some steelhead remain, or over-winter, in the Snake River before traveling to their natal streams. The majority of kelt outmigration is believed to occur during this period (D. Hurson, USACE, personal comm.). Thus, pre-spawned fish are moving to their spawning grounds in April and May while post-spawned steelhead (i.e., kelts) are leaving their spawning grounds in search of the sea. This movement is detected at juvenile bypass systems throughout the Snake River. Difficulties, however, arise between distinquishing an outmigrating kelt from a pre-spawned adult steelhead.

Corps employees at Snake River dams attempt to identify which of the thousands of adult steelhead that fallback through the juvenile collection systems each year are kelts. Their methods are vey subjective and probably equally imprecise (R. Baxter, USACE, personal com.): the person who removes the fish from the separator notes the animal's girth and records "slim" fish as kelts and "plump" fish as pre-spawners. Such cursory methods are confounded by the fact that, after over-wintering, many pre-spawners are quite slim and by the fact that males may lose little girth during spawning (R. Carmichael, ODFW, pers. Com.). Clearly, the current method of kelt identification is not reliable (R. Baxter, USACE, personal com.) and needs refinement if accurate kelt estimates are to be obtained.

The estimated number of kelts recorded at Snake River bypass systems vary. For example, Little Goose Dam recorded only 54 kelts in 1997 while Lower Monumental Dam recorded 475 kelts (USACE 1997b). Due to kelt identification problems, the actual number of kelts may be significantly higher or lower. In should be noted that over 70% of the kelts identified at Little Goose dam were wild Snake River steelhead and 27% of the kelts identified at Lower Monumental Dam were of wild origin. Despite their origin (hatchery or wild) the majority of kelts outmigrating in the main-stem spawned naturally, and their progeny will be considered wild.

Prior steelhead supplementation experiments, which have utilized kelts, demonstrate the effectiveness of reconditioning. For example, a study conducted by Wingfield (1976) showed that summer steelhead kelts in the Siltez river could be reconditioned to spawn again. Over 60% of the captured female kelts from this study were reconditioned and artificially spawned . All reconditioned females gained weight and produced progeny that returned to the Siltez as adults two years after smolt release (Wingfield 1976). Studies have also shown that the majority of steelhead repeat spawners are female (Bruce et al. 1990, Leider et al. 1986, and NMFS 1996), which would make reconditioning effort more productive.

There are a number of studies regarding Atlantic salmon (*Salmo salar*) and sea trout (*Salmo trutta*) kelt reconditioning (Guathier et al. 1989; Johnston et al., 1987; Poole et al. 1994). In these studies, iteroparous salmonids have been successfully captured, artificially reconditioned and held captive in fresh water for another spawning episode. Gauthier et al. (1989) had a 100% survival rate for reconditioned kelts. Of these, 83%

were able to naturally spawn in an artificial enclosure. Studies have also temporarily held kelts captive until they are fit for sea survival (Foster and Schom 1989, Guauthier et al. 1989). Over 80% of these sea released, captive kelts returned to their natal streams (Gauthier et al. 1989).

Accurate data on the number of kelts in the Snake River must be obtained before reconditioning efforts can be initiated. Furthermore, kelts must be accurately identified to avoid the "reconditioning" of pre-spawned fish, especially pre-spawned wild fish. We propose using ultrasound technology to decipher what proportion of adults traveling through the bypass system are kelts and what proportion are pre-spawned fish. Once this information has been collected it will be used to determine if reconditioning would be beneficial. For example, if only a small number of kelts use the bypass system it will not be possible to collecting adequate fish for brood stock. If hundreds or even thousands of kelts can be collected then reconditioning efforts would be justified.

Assuming similar reconditioning rates to Wingfield's study (1976) and average fecundity rates from Snake River Lyons Ferry hatchery fish (SSR, 1992), 500 captured female kelts could generate over 2,305,500 eggs and produced 680,123 smolts. Given a 0.49% smolt to adult survival rate (SSR, 1992) for upper Snake River (Dworshak hatchery fish) steelhead, progeny from this experiment could produce 3,332 adults. Such success rates would clearly be beneficial to Snake River populations. Furthermore, it would be a cost-effective way to augment wild and hatchery brood stock. An alternative to captive reconditioning would be kelt transportation. Kelts could be collected at hydroelectric facilities and transported below Bonneville Dam. Similar studies with Atlantic salmon had a 70% release-to-return success rate (Foster and Schom 1989).

If hydroelectric facilities hinder kelt outmigration, by prohibiting safe passage, a significant life history component of these stocks is being lost. Obtaining information on kelts would enable managers to quantify the potential impact of these fishes on threatened Snake River populations. Furthermore, if significant numbers of kelts are prevented from reaching the sea, then measures can be initiated to aid kelt survival. Ultimately, enhancement efforts through kelt reconditioning may significantly augment steelhead escapement in the Snake River.

b. Proposal objectives.

Objectives	**Assumptions to test**	**Expected result, outcomes and/or products**
1) Kelt enumeration	Kelts can be identified with ultrasound.	An accurate estimate of the number of kelts outmigrating in Snake River bypass facilities. Results included in a report.
2) Validate kelt Identification	Using hatchery fish (pre and post spawned) will produce	Confidence limites for ultrasound methods will be

	estimates of ultrasound accuracy.	established
3) Develop a morphological key	A detailed examination of kelts and pre-spawned fish will segregate fish based on morphological traits.	Have a method to distinguish pre and post spawned fish based on morhpological traits only.
4) Locate other facilities for kelt collection	Kelt identificatoin and collections methods developed in the Snake River can be applied to regions	List of other facilities that can benefit from kelt collection. Establish links with and provide technology to other facilities.
5) Collect and recondition kelts	Facilities can be constructed to safely contain and recondition kelts.	Reconditioning will serve as a cost-effective method to augment steelhead populations.
6) Evaluate kelt reconditioning success	Reconditioned kelt can be tagged and relocated as returning adults	Measurable escapement numbers as a result of reconditioning efforts.

c. Rationale and significance to Regional Programs.

Steelhead kelts – now being collected in juvenile bypass systems and returned to the river to die – are a potentially valuable resource for rebuilding depleted runs of wild steelhead in the Snake R. and other elsewhere. These kelts could be "reconditioned" to spawn again. Although none of the regional restoration plans explicitly mention this novel opportunity, reconditioning wild kelts could help satisfy one of the core needs common to all the plans: how to rebuild wild/natural populations expeditiously in ways that preserve the diversity within, and the overall fitness of, those populations.

For example, the FWP calls for actions that:
+ "…provide immediate increases in natural production and survival" (7.0A.1);
+ improve the "…conservation of biodiversity, including identification of …alternative approaches to artificial production…" (7.1B.2);
+ "…identify limiting factors for wild and naturally spawning populations" (7.1C.3);
+ protect and restore depleted populations on a site-specific basis as quickly as possible, while recognizing the legitimate associated biological concerns(7.2); and
+ pursue new production initiatives, including captive broodstock and supplementation programs (7.4).

Wy-Kan-Ush-Mi Wah-Kish-Wit advocates supplementation as a useful and necessary restoration measure (5B, Hypothesis 4). Reconditioning kelts may provide some of the benefits of supplementation without many of the associated concerns.

This approach has the advantage of:

1. Assisting wild populations using fish whose fitness has already been proved.
2. Using wild fish that have already spawned naturally and that would otherwise die.
3. Efficiency: it uses existing juvenile collection facilities and hatchery adult holding facilities.
4. Broad applicability thorughout the region where wild steelhead stocks are depleted.
5. Maintaining and enhancing iteroparity, a life history quality that is now being selected out of upriver populations by high cumulative mainstem passage mortalities.
6. Applying techniques that have been successful with coastal steelhead and Atlantic salmon.

Technical questions that need to be addressed by this study are relatively straightforward:

1. Can kelts be quickly and accurately distinguished from prespawners that also fall back through collection systems? Ultrasound is very promising for this purpose; it will be validated and morphological techniques will be explored.
2. Can sufficient wild kelts (especially females) be collected to justify a long-term reconditioning effort? We will provide estimates of the numbers available at Snake R. collector dams and identify other points where wild kelts might easily be collected (e.g., Prosser Dam on the Yakima R.) and help managers determine the costs of producing juvenile steelhead from reconditioned kelts under three general management scenarios: 1) short-term reconditiong and release below Bonneville Dam, 2) full-year reconditioning and release at the collection point during the next spawning migration, and 3) full-year reconditioning and captive spawning.
3. What kelt survival rates and potential egg/juvenile production might be expected from each of the three alternative reconditioning management scenarios? This will be the most telling question, and other organizations (e.g., ODFW, Umatilla Tribe, USFWS) are interested in helping answer it. For example, ODFW has expressed interest in testing management scenario 3 with hatchery steelhead and other funding beginning in 1998 or 1999. The Umatilla Tribe and USFWS (Abernathy NFH) will help test management scenarios 1 and 2 as part of this project.

We also anticipate some policy questions in later years if reconditioning succeeds. For example, which production programs might incoporate kelt collection and reconditioning into their operations and what portion of the costs will be borne by those programs? We will encourage managers to begin considering such questions, and we expect that most or all costs of any eventual ongoing reconditioning activities will be borne by the production programs that propose them.

The project is scaled and sequenced to quickly test methods and, if they prove feasible, to help mangers apply them. Actual reconditioning under this project would begin in year 2 (FY00) with first return/spawning of reconditioned fish in year 3 (FY01).

d. Project history

Not applicable. New project

e. Methods.

Methods

Obj. 1: Enumerate kelts (FY99)
An initial critical assumption is that kelts can be distinguished from pre-spawners among the hundreds of wild adult steelhead that fallback through the juvenile collection systems at Snake R. dams, and perhaps elsewhere. We would not wish to misclassify a pre-spawner as a kelt. The present subjective methods are believed to be very imprecise by the Corps biologists and technicians who must remove the fallbacks from the juvenile separator. Ultrasound is sufficiently promising that we propose to begin using it to scan and record images from these fallbacks (Tasks 1.a. and 1.b.) for later analysis (Task 1.c.) based on images obtained during concurrent validation of the ultrasound methods at a hatchery (Obj. 2).

A total of 400-500 fallbacks will be sampled during the peak fallback months of April and May at Lower GraniteDam, with up to 50 sampled per day. The proportion of kelts on each sampling day can then be estimated and bounded with better than +-10% precision (Snedecor and Cochran 1980) based on an expected proportion of 0.10 kelts(from an average of 1997 estimates at Lower Monumental and Little Goose dams).

Adult steelhead will be dipnetted from the juvenile separator, anesthesized in buffered solution of MS-222 and fresh river water in a 380-l sampling tank, and scanned with an Aloka® 5.0 MHz ultrasound machine. The ultrasound examination technique includes placing a 5.0 MHz linear probe on the abdomen of the fish just posterior of the pectoral fin and then moving posteriorly on the abdomen to image the testes or ovaries. The machine displays an image in real time to permit feedback to the operator. This image can also be annotated and stored onto standard VHS videotape for later viewing. In our past studies, the presence of ovaries and testes in mature fish were obvious and we suspect that differentiating kelts from unspawned steelhead would have similar results. Data will also be taken on fish length, girth, fin condition, H/W origin (based on adipose fin), physical anomalies, and other traits that may distinquish kelts for pre-spawners. After recovery, the fish will be released to the tailrace via the adult return system. Total handling time will be about 7-11 min.

Recorded scans will be viewed and analyzed in the CRITFC video lab in June, after the ultrasound method has been validated with hatchery trials (Obj. 2). Scans obtained from the hatchery trials will be used as reader training and testing collections for the , with target accuracies of 100% correct classification of female kelts and 95% correct classification of male kelts. If target accuracy is achieved, the operator will analyze the recorded ultrsound scans obtained from the dam and classify by gender and by spawning condition (i.e., pre-spawn or kelt). Bounded estimates of the proportion and number of kelts will then be calculated for both genders for the days sampled and a less precise estimate will be made for the entire season.

Obj. 2: Validate kelt identification (FY99)

Obj. 2 will be concurrent with Obj. 1 and will validate ultrasound methods with known pre-spawners and kelts. Adult steelhead will be scanned with the same ultrasound device both before and after spawning at the CTUIR Minthorn Springs facility and perhaps also at one or more ODFW hatcheries in NE Oregon. Target numbers are 30 spawners of each gender, with scans of each spawner before and after spawning (120 sample scans, total). Scans of partially spawned females will also be collected to determine if incompletely spawned kelts can be identified.

Obj. 3: Develop a key of morphological traits associated with kelts (FY99)

The ultrasound methods are expected to work well, but they may be a bit expensive ($17.5K per machine) and time-consuming for broad and continual use if reconditioning is adopted as a management program. A quick and accurate means of identifying kelts based on one or more morphological traits would be preferred. Therefore, concurrently with collection of ultrasound scans on the dam (Obj. 1) and validation of the ultrasound methods in a hatchery (Obj. 2), we will also record measurements and traits of sampled fish for later comparison with known gender and spawning condition based on ultrasound scans. Multiple regression will be used to determine if one or more readily observable traits provide an accurate indication of the spawning condition (i.e., pre-spawner or kelt) of steelhead adults that fall back over dams and weirs. If such traits are found, a key or decision diagram will be produced to help fish handlers determine spawning condition.

Obj. 4: Locate other facilities for kelt collection (FY99)

The Snake River collector dams are not the only places where wild steelhead kelts of depleted populations may be available for collection and reconditioning. Mainstem dams in the mid-Columbia, tributary dams on the Yakima (e.g., Prosser) and other streams, and at weirs associated with production facilities (e.g., the Imnaha R. adult trap). For this objective, we will interview tribal and agency staff, and staff of the mid-Columbia dam operators, to identify where, in their area of knowledge, wild steelhead kelts might be readily collectable. Emphasis will be on streams within the range of the ESUs proposed for listing under the ESA. A list of these sites, approximate numbers of steelhead falling back past the facility, and names of contact persons would be published in the annual report.

Obj. 5: Collect and recondition kelts (FY00)

Collection and reconditioning tests would depend on the ultrasound or other method proving accurate in distinguishing kelts from pre-spawners. Reconditioning would not be tested with fish that could not be positively identified as kelts.

We will test reconditioning for three general management scenarios:

1. Short-term reconditioning and release below Bonneville Dam.
2. Long-term reconditioning and release near the collection site during the subsequent spawning migration.
3. Long-term reconditioning and captive spawning.

All scenarios will require small short-term (e.g., 1-5 d) holding facilities at the collection point(s), periodic transport of the collected kelts to the reconditioning appropriate facilities, and a therapeutic regime of feeding (perhaps a specialized diet) and perhaps treatment for disease (e.g., dermal fungus). Basic needs have been identified and budgeted in this proposal; further refinement will occur before proposals are submitted for FY00. We propose to evaluate all three scenarios.

Scenario 1 is the simplest, least expensive, and least intrusive into the natural lifecycle of the fish. It circumvents the cumulative mortality of migrating downstream through as many as 7 additional dams (they will have made it through at least one by the time they are collected) and facilitates survival and repeat spawning through short-term therapy. To test evaluate this scenario, kelts will be reconditioned at the Abernathy Salmon Technology Center for 2-6 wk, individually marked/tagged, and released directly from the facility. Those that survive to spawn in the following year or second year following, will migrate back to their natal streams and spawn naturally. Progeny production from these fish will probably be lower than for the other two scenarios.

Scenario 2 involves reconditioning and maintaining the kelts in captivity until the next spawning season, at which time they would be released at or near the place where they were collected. The reconditioning would occur at a hatchery near the collection/release point. In FY00, with the collection/release point being a Snake R. dam, the reconditioning facility would be one managed by the CTUIR, NPT, or ODFW or WDFW. Prior to release, the fish would be marked and probably implanted with radio tags to help determine (evaluate, Obj. 6) whether they were able to migrate into spawning areas. This scenario would be among the most costly, but would retain the probability that the fish would spawn naturally in their natal streams.

Scenario 3 is essentially captive broodstock: the kelts would be reconditioned until the next spawning season, then spawned at the hatchery. Presumably, the eggs would become part of a supplementation program. This is the scenario that ODFW may test with hatchery kelts and other funding in 1998 or 1999 (T. Whighsel, ODFW, pers. Comm.). Their study may or may not satisfy our needs to evalute this scenario. This scenario will probably provide the best production potential from the available kelts, and would incorporate gametes from wild fish into supplementation programs without depleting the populations of wild spawners that would have existed in the absence of a reconditioning program.

Obj. 6: Evaluate kelt reconditioning success (FY00-01)

Survival to spawning and reproductive success will be the ultimate performance objective for all three scenarios. This will obviously be easier to evaluate with captive fish (Scenario 3) than with fish that are released to spawn naturally. Methods will vary among the scenarios and will be refined during FY99. In general, tagged fish released downstream under Scenario 1 will be monitored on their spawning migration as they pass adult PIT tag detectors and the adult migrant trap at Lower Granite Dam. Beyond Lower Granite, we will probably assume that spawning success is equal to the virgin spawners. The evaluation will then be based on survival rate alone and assumed egg production.

Fish released under Scenario 2 will probably be radio-tracked and the evaluation will depend on the number that are tracked into or close to spawning areas and assumptions about egg production. Scenario 3 will allow detailed evaluation of cost per egg and cost per juvenile produced.

Factor that may limit success:

Again, methods in object 3 are dependent on outcomes and assessment generated in Object 1 and Object 2. If adequate numbers of kelts are not discovered traveling through bypass systems then reconditioning efforts may not be cost effective and/or beneficial to Snake River populations. Collaboration and protocol development with the ODFW and the Umatilla tribe will begin in 1999. Results from their research will be incorporated into the 2000 kelt collection and reconditioning methods.

f. Facilities and equipment.

Limited space, equipment and time are needed for this experiment in 1999. One person will need access to Snake River bypass facilities to conduct kelt identification research. Access to the Umatilla's hatchery is also needed for the hatchery ultrasound evaluation/validation. The following equipment is needed to conduct this research: an Aloka® 500v ultrasound machine to scan adult fish, two 380-P plastic buckets to hold and anesthetize specimens, MS-222, and flood lights for night sampling (and some othe misc. field supplies). A GSA rental car is needed from 15 March to 30 May 1999 to transport the examiner. Office space and a computer for kelt enumeration will be provided by the CRITFC. A detailed facility and equipment list for kelt capture and kelt reconditioning (objective 5 and 6) will be provided in 2000.

g. References.

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Section 8. Relationships to other projects

This project will test a new method for enhancing wild steelhead stocks. If kelt reconditioning proves feasible, it will probably be incorporated into supplementation programs funded under the FWP (e.g., Nez Perce Tribal Hatchery, NE Oregon Hatchery, Yakima Tribal Hatchery) and production programs funded from other sources.

Adult steelhead in the juvenile bypass/collection system will be examined (to distinguish kelt vs. prespawner) at Little Goose Dam and possibly at Lower Granite and Lower Monumental dams (D. Hurson, USACE, Walla Walla District; R. Baxter, Little Goose Project Biologist), where they already must be netted and transferred back to the river. Further handling of these adult steelhead for this study (Obj. 1) is expected to require coordination/approval through CBFWA's Fish Passage Advisory Committee, and new or modifed ESA permits probably will be required from NMFS, assuming steelhead are listed under the ESA.. Again, assuming ESA listing occurs, collection of kelts in FY00 for reconditioning tests (Obj. 5) will probably require a Section 10 permit.

Ultrasound (Obj. 2) will be validated on steelhead broodstock at the CTUIR's Minthorn Springs facility (Gary James, Fisheries Program Manager) in FY99 and perhaps at one or more presently unidentified ODFW facilities in NE Oregon. Dr. Al Caudle (University of Georgia) will provide initial training on use of the ultrasound equipment. Adults being reconditioned in FY00-01 (Obj. 5) will be held at CTUIR facilities, at the USFWS'Abernathy Salmon Technology Center (Carl Burger, Director), and/or at other appropriate upriver (for Scenario 2) and downriver (for Scenario 1) facilities. The feed mill at Abernathy Salmon Technology Center will be used to formulate special diets, if useful/necessary for reconditioning. Various tribal and agency fishery staff, and the staff of mid-Columbia dam operators, will contribute information collected on other sites in the region where wild kelts may be collected for reconditioning in later years.

Section 9. Key personnel

Allen F. Evans, Fishery Biologist	Project Leader: 0.5 FTE
Roy Beaty, Managing Scientist	Program Manager: 0.1 FTE

See following resumes for details.

Principle Investigator: Allen F. Evans
Title: Fisheries Biologist
FTE: 0.4

Education: B.A., The College of Wooster, Wooster, Ohio. May 1995.
Major Biology

Rhodes University, Grahamstown, South Africa. May – August 1994. Attended graduate fisheries classes and conducted research for the fisheries department.

Relevant Courses: Biostatistics, Chemistry, Ecology, Evolution, Ethology, Vertebrate and Invertebrate Zoology, and Limnology

Scientific Publications: Co-author, "The possible Significance of Egg Size on the Growth and Survival of Post-hatched *Oncorhynchus mykiss* fry" Bylde Aquaculture Spring, 1996.

"Symptoms of Gas Bubble Trauma Induced in Salmon (*Oncorhynchus mykiss)* by Total Dissolved Gas Supersaturation of the Columbia and Snake Rivers", Annual Reports to Bonneville. Columbia River Inter-Tribal Fish Commission. Winter, 1997 and 1998.

Awards:
- Sigma XI, The Scientific Research Society – elected member, 1995
- Honors: Independent Study Thesis. May 1995.
- College of Wooster Dean's List. Spring 1994, 1995

Computer Skills: Microsoft Word, Word Perfect, Access, Paradox, Excel, Quattro, Statview, Quicken, Power Point, Delta graph and many other programs.

Employers: Columbia River Inter-Tribal Fish Commission (Current Employer), National Biological Service (now Biological Resource Division), Department of Ichthyology at Rhodes University.

Allen has four years, two years on the Columbia and Snake Rivers, research experience with salmonids. Allen has experience handling and anesthetizing salmonids, and is familiar with Snake River bypass facilities. Allen will maintain the following responsibilities for work conducted in 1999: Manage database, graphic programs, statistical programs and other computer oriented skills. Serves as field biologist by examining adult steelhead at bypass facilities. Responsible for the completion of all field research objects in 1999. Analyze, synthesize and prepare data for technical reports, publications and seminars. Produce technical papers and give scientific presentations. Maintain scientific sampling permits (ESA etc…) and coordinate research needs with other agencies.

Roy E. Beaty

MS Fisheries Science (statistics minor); Oregon State University, 1992
BS Fisheries Science, Oregon State University, 1986
BS Business Administration, Oregon State University, 1986

Current Employment
Managing Scientist, Columbia River Inter-Tribal Fish Commission, responsible for the Mainstem, Estuary, and Ocean Program of the Fishery Science Department. Also, ***Owner, Willowell Nursery***, specializing in native plants. Work with developers and conservation groups to salvage native plants from development sites and reuse them in private landscapes and public restoration projects.

Employment History
Managing Scientist, Columbia River Inter-Tribal Fish Commission 1991-Present
Fisheries Scientist: Fish Passage, CRITFC 1989-91
Graduate Fishery Intern/Research Assistant, CRITFC and OSU 1987-89
General Manager, Growers Refrigerating Co. 1985-86
Tactical Microwave Systems Operator/Repairman/Team Chief, US Army 1976-80

Expertise
Undergraduate studies focused on the technical and business aspects of aquaculture, with graduate research into the effects of management actions on Columbia River upriver bright fall chinook salmon. Developed knowledge of technical issues and methods of mainstem juvenile and adult passage through participation in regional coordinating and scientific review groups. Familiarity with Corps projects and staff was acquired through implementation and leadership of tribal predator control fisheries at Snake River and lower Columbia River dams. Personal interests and abilities are incline towards implementation of action-oriented resource restoration and management projects.

Publications
Beaty, R.E. 1996. Evaluation of Deschutes River fall chinook salmon. Tech. Rep. 96-6, Columbia River Inter-Tribal Fish Commission, Portland, OR.

Beaty, R.E. 1996. Changes in size and age at maturity of Columbia River upriver bright fall chinook salmon (*Oncorhynchus tshawytscha*): Implications for stock fitness, commercial value, and management. Tech. Rep. 96-7, Columbia River Inter-Tribal Fish Commission, Portland, OR. (reprint of MS thesis, OSU 1992)

Beaty, R.E., B.L. Parker, K. Collis, and K. McRae. 1991. Controlled angling for northern squawfish at selected dams on the Columbia and Snake rivers. Report C. *In* C.F. Willis and A.A. Nigro, *editors*. Development of a System-wide Predator Control Program: Stepwise Implementation of a predatio Index, Predator Control Fisheries, and Evaluation Plan in the Columbia River Basin. 1991 Ann. Rep., Contract DE-BI79-90BP07084, Bonneville Power Administration, Portland, OR

Section 10. Information/technology transfer

Aside from annual progress reports, significant results may be published in a peer reviewed journal. Methods for distinguishing kelts from prespawners (e.g., ultrasound, morphological key), if successful, will be provided as a handbook to interested users; workshops and field training will be provided by CRITFC project staff as requested, within the limits of the project's duration and funding. Methods for reconditioning, if successful, will be presented to aquaculturists and fish managers and researchers at the Northwest Fish Culture Conference, meetings of the American Fisheries Society, etc. Findings will also be presented at BPA Project Reviews and/or in other review forums, as requested. We will be available to advise decision makers who are considering the relative merits of long-term application of one or more of the management scenarios.